

LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 5 | Technical Appendices

CFAg | Central Chilterns

Data appendix (AG-001-009)

Agriculture, forestry and soils

November 2013

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Department
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Contents

Contents	i
1 Introduction	1
2 Soils and Agricultural Land Classification surveys	2
2.1 Background	2
2.2 Soils and land resources	3
2.3 Soil and land use interactions	6
3 Forestry	14
4 Assessment of effects on holdings	15
5 References	21

List of figures

Figure 1: Batcombe, Coombe 1 and Frome soil development in a landscape context	5
Figure 2: Methodology for calculating Agricultural Land Classification grade according to soil droughtiness	8
Figure 3: Agricultural Land Classification grade according to soil wetness	12

List of tables

Table 1: Bedrock and soil forming materials	4
Table 2: Dominant soil series descriptions	5
Table 3: Interpolated agro-climatic data	9
Table 4: Soil profile descriptions from detailed soil surveys at Mantle's Farm	9
Table 5: Local agro-climatic conditions	10
Table 6: Area of woodland within the study area and construction boundary	14
Table 7: Summary of assessment of effect on holdings	15

1 Introduction

1.1.1 The agriculture, forestry and soils appendix for the Central Chilterns community forum area (CFA09) comprises:

- soils and Agricultural Land Classification (ALC) surveys (Section 2);
- forestry (Section 3); and
- farm impact assessment summaries (Section 4).

1.1.2 Maps referred to throughout the agriculture, forestry and soils appendix are contained in the Volume 5, Agriculture, Forestry and Soils Map Book.

2 Soils and Agricultural Land Classification surveys

2.1 Background

- 2.1.1 The agricultural baseline data has been derived from both desk study and site investigation. Information gathered by the desk study has related primarily to the identification of soil resources in the study area, the associated physical characteristics of geology, topography and climate which underpin the assessment of agricultural land quality, and the disposition of land uses. The main sources of information have included:
- National Soil Map¹;
 - Soils and Their Use in South East England²;
 - solid and superficial deposits from the Geology of Britain viewer³;
 - gridpoint meteorological data for Agricultural Land Classification of England and Wales⁴;
 - Provisional Agricultural Land Classification of England and Wales (1:250,000)⁵;
 - Likelihood of Best and Most Versatile Agricultural Land (1:250,000)⁶;
 - agri-environment schemes⁷;
 - computer generated light detection and ranging (LiDAR) elevation data for determination of gradient;
 - aerial photography; and
 - on-site soil and ALC surveys.
- 2.1.2 Information gathered by field survey has related to the enhancement of desk-based information on soils and agricultural land quality and the engagement with landowners and tenants to establish the nature and extent of agricultural, forestry and related rural enterprises.
- 2.1.3 Where the collection of agricultural site information has enabled a review/refinement of published information this was undertaken in accordance the methodology prescribed by the Ministry of Agriculture, Fisheries and Food (MAFF)⁸.

¹ Cranfield University, (2001), *The National Soil Map of England and Wales* 1:250,000 scale.

² Soil Survey of England and Wales, (1984), *Soils and Their Use in South East England*.

³ British Geological Survey; <http://bgs.ac.uk/geologyofbritain/home/html>; Accessed: 18 March 2013.

⁴ Meteorological Office, (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*.

⁵ Ministry of Agriculture, Fisheries and Food (MAFF), (1983), *Agricultural Land Classification of England and Wales* (1:250,000).

⁶ Department for Environment, Food and Rural Affairs (Defra), (2005), *Likelihood of Best and Most Versatile Agricultural Land* (1:250,000).

⁷ Multi-Agency Geographical Information for the Countryside (MAGIC); <http://www.magic.gov.uk/>; Accessed: August 2013.

⁸ MAFF, (1988), *Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land*.

- 2.1.4 Engagement with landowners and tenants between May 2012 and June 2013 has established the nature and extent of agricultural, forestry and related rural enterprises. Information obtained from farm impact assessment interview surveys has been taken as a factual representation of local agricultural and forestry interests and has not been subject to further evaluation.

2.2 Soils and land resources

- 2.2.1 This part of the appendix describes the findings of a desktop study and targeted ALC survey that identified existing soil and agricultural land resources in the study area.
- 2.2.2 The only agricultural land subject to a soil survey was at Mantle's Farm (Holding CFA09/2); the survey was carried out in September 2012. This site was selected as it is situated within a large expanse of agricultural land across which a single soil type is mapped. The site was chosen as it was considered that results from this survey would be representative of the surrounding agricultural land. Permission was sought to access other holdings for survey, but was not granted.
- 2.2.3 The location and extent of soil types and agricultural land in the different ALC grades are influenced by topography and drainage, and by geology and soil parent materials which are described in turn in the following section.

Topography and drainage

- 2.2.4 The study area is located within the Chilterns Area of Outstanding Natural Beauty (AONB) which is characterised by rolling hills, plateaux, dry valleys and prominent escarpments rising to approximately 190m above Ordnance Datum (AOD).
- 2.2.5 The River Misbourne lies to the west of the Proposed Scheme flowing southwards from its source at Great Missenden at approximately 130m AOD. The river is a 'perched' stream, flowing over a bed of impermeable material on top of a porous substrate and can disappear during periods of low rainfall.

Geology and soil parent materials

- 2.2.6 The principal underlying geology mapped by the British Geological Survey (BGS) is that of the White Chalk subgroup which outcrops to form a long north-east to south-west escarpment facing north-west. There is a long backslope which gradually falls to the south-east and which is covered by various plateau drift deposits. The Chalk is principally hard chalk with occasional interbedded soft to medium hard chinks, flints and marls (lime-rich mudstone).
- 2.2.7 To the north-west the chalk scarp has outwash deposits at its foot which give way to the underlying clay. Further to the north is found an extensive clay plain formed on the Kimmeridge Clay.
- 2.2.8 Superficial alluvial deposits of clay, silt, sand and gravel are present in the valley along the floodplain and on higher ground is the Clay-with-Flints Formation.
- 2.2.9 A list of geological strata occurring within the study area is provided in age order in Table 1 and shown on Map WR-02-009 (Volume 5, Water Resource and Flood Risk Assessment Map Book).

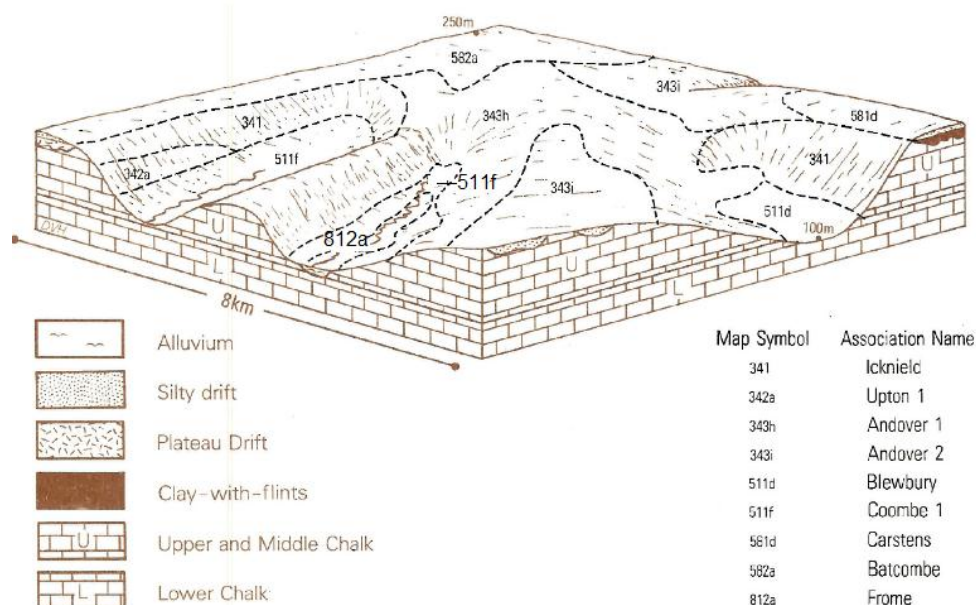
Table 1: Bedrock and soil forming materials

Formation	Composition/soil parent material
Kimmeridge Clay	Calcareous kerogen-rich silty or sandy mudstones with thin siltstone and cementstone beds
White Chalk Subgroup	Chalk with discrete marl seams, nodular chalk and flint seams throughout
Superficial deposits	
Alluvium	Compressible silty clay (silt, sand and gravel)
Clay-With-Flints	Unbedded, heterogeneous sandy clay with pebbles of flint, formed from bedrock of the Chalk Group, Palaeogene Formation and the Upper Greensand Formation

Description and distribution of soil types

- 2.2.10 The characteristics of the soils are described by the Soil Survey of England and Wales² and shown on the National Soil Map¹. The soils are grouped into associations of a range of soil types and their distribution is shown on Map AG-02-009 (Volume 5, Agriculture, Forestry and Soils Map Book).
- 2.2.11 The National Soil Map shows soils which are predominantly described as slightly acid, loamy and clayey soils with impeded drainage. This broad soil type is intersected by freely draining, lime rich loamy soils associated with the hill slopes rising up from the River Misbourne along which loamy and clayey floodplain soils are mapped with naturally high groundwater.
- 2.2.12 The predominant soil type mapped is that of the Batcombe association. This association covers the highest elevations in the Central Chilterns and comprises typically variably flinty fine silty or fine loamy topsoils, overlying slightly stony clay subsoils, which are susceptible to slight seasonal waterlogging. The association is developed over the Clay-with-Flints Formation.
- 2.2.13 Frome and Coombe 1 soils are mapped in the valley bottom and sides of the River Misbourne. Both are characterised by silty and clay loam soils overlying chalk. The Frome soils mark the immediate floodplain and hence are wet often being assessed as Wetness Class⁹ (WC) IV, poorly drained. Due to the underlying chalk and their occurrence on valley sides Coombe 1 soils are typically well drained and of WC I.
- 2.2.14 The Charity 2 association is mapped in the steeply sloping valleys to the north of the source of the River Misbourne. The main soils are well drained (WC I) and fine silty developed in flinty and chalky drift.
- 2.2.15 Figure 1 shows three of these soil associations in a landscape context depicting how the locations are a reflection of geology and topography.

⁹The Wetness Class (WC) of a soil is classified according to the depth and duration of waterlogging in the soil profile and has six bands.

Figure 1: Batcombe, Coombe 1 and Frome soil development in a landscape context ¹⁰

2.2.16 Data describing the predominant soil series of each association present within the study have been provided in Table 2. References to soil colours have been derived from a standard Munsell Soil Colour Chart¹¹.

Table 2: Dominant soil series descriptions

Coombe series	Frome series	Batcombe series	Charity series
0cm-25cm, dark brown (10YR3/3) ¹² slightly stony silty clay loam; medium angular flint; moist; strongly developed medium packing density; moderately weak soil and ped strength; many very fine fibrous roots; very calcareous; sharp smooth boundary	0cm-8cm, very dark greyish brown (10YR3/2) very slightly stony silty clay loam; small rounded flint; moist; moderately developed fine subangular blocky; low packing density; moderately weak soil and ped strength; abundant very fine fibrous roots; very calcareous; clear smooth boundary	0cm-25cm, brown, slightly stony silt loam or silty clay loam	0cm-20cm, dark greyish brown, slightly or moderately stony silty clay loam
25cm-44cm, brown to dark brown (7.5YR4/4) moderately stony silty clay loam; very small subrounded chalk; moist; strongly developed fine subangular blocky; medium packing density; moderately weak soil and	8cm-47cm, light brownish grey (10YR6/2) very slightly stony silty clay loam; many fine reddish yellow (7.5YR 6/8) mottles; small rounded flint; moist; moderately developed medium prismatic with greyish	25cm-60cm, brown, slightly stony silty clay loam; moderate medium angular blocky structure	20cm-35cm, brown, slightly or moderately stony silty clay loam; strong medium subangular blocky structure

¹⁰ National Soil Resources Institute (NSRI), (2013), *The Soils Guide*. Cranfield University, UK.; www.landis.org.uk. Accessed: 14 August 2013.

¹¹ Munsell Color, (2000), *Munsell Color Charts*, Munsell Color, Grand Rapids, MI, USA.

¹² Munsell colour notation describes colour by three attributes: hue with five main colours - red (R), yellow (Y), green (G), blue (B), and purple (P) with a preceding intermediate value 2.5-10; value or brightness where zero is black (most dark) and ten is white (most light); and chroma that distinguishes the difference from a pure hue to a gray shade.

Coombe series	Frome series	Batcombe series	Charity series
ped strength; common very fine fibrous roots; very calcareous; abrupt irregular boundary with fine chalk gravel in the bottom of tongues	brown (10YR5/2) faces; medium packing density; moderately firm ped strength; many fine fibrous roots; very calcareous; clear wavy boundary		
44cm-80cm, very pale brown (10YR7/4) moderately stony sandy silt loam; very small subrounded chalk with some large patches with medium chalk fragments and large flints; moist; massive; medium packing density; moderately strong soil strength; extremely calcareous	47cm-100cm, extremely stony with slightly calcareous sandy loam interstitial material; very small to large flint, quartz and chalk; wet	60cm-100cm, yellowish brown with yellowish red mottles; slightly stony clay; weak medium prismatic structure	35cm-85cm, yellowish brown, slightly or moderately stony silty clay loam; strong coarse subangular blocky structure
			85cm-100cm, strong brown; slightly or moderately stony silty clay loam; strong medium prismatic structure

2.3 Soil and land use interactions

Agricultural land quality

- 2.3.1 A review of background ALC information has been undertaken to ascertain the land quality within the study area. The review also sought to identify the extent of existing detailed post-1988 ALC information to ensure that surveys are not repeated unnecessarily.
- 2.3.2 As there is very little existing detailed post-1988 ALC data within the study area it has been necessary to undertake a detailed ALC survey at Mantle's Farm, Wendover. Permission was sought to survey across a wider area, but access was not granted. In areas where permission was not granted agricultural land quality has been assessed from available published sources.

Detailed Agricultural Land Classification survey - Mantle's Farm

- 2.3.3 At the time of the survey the land at Mantle's Farm was in stubble.
- 2.3.4 Soil profiles were examined using an Edelman (Dutch) auger and spade. Approximately one observation was made for each 100m linear run of route of the Proposed Scheme. At each observation point the following characteristics were assessed for each soil horizon up to a maximum of 120cm or any impenetrable layer:
- soil texture;

- significant stoniness;
- colour (including local gley and mottle colours);
- consistency;
- structural condition;
- free carbonate; and
- depth.

2.3.5 WC was inferred from the matrix colour, presence or absence of and depth to, greyish and ochreous gley mottling and/or poorly permeable subsoil layers at least 15cm thick.

2.3.6 Soil droughtiness was investigated by the calculation of moisture balance equations. Crop-adjusted available water is estimated from texture, stoniness and depth and then compared to a calculated moisture deficit for the standard crops of wheat and potatoes. The moisture deficit is a function of potential evapotranspiration and rainfall. Grading of the land can be affected if the available water is insufficient to balance the deficit and droughtiness occurs. When a profile is found with significant stoniness, sufficient to prevent penetration of a hand auger, then it is assumed for the purposes of calculating droughtiness that similar levels of stoniness continue to the full 1.2m depth considered. The methodology and calculation used to determine the severity of a droughtiness limitation is given in Figure 2.

Figure 2: Methodology for calculating Agricultural Land Classification grade according to soil droughtiness ¹³

$$AP \text{ wheat (mm)} = \frac{TA_{vt} \times LT_t + \sum (TA_{vs} \times LT_{50}) + \sum (EA_{vs} \times LT_{50-120})}{10}$$

where

TA_{vt} is Total available water (TA_v) for the topsoil texture

TA_{vs} is Total available water (TA_v) for each subsoil layer

EA_{vs} is Easily available water (EA_v) for each subsoil layer

LT_t is thickness (cm) of topsoil layer

LT_{50} is thickness (cm) of each subsoil layer to 50 cm depth

LT_{50-120} is thickness (cm) of each subsoil layer between 50 and 120 cm depth

Σ means 'sum of'.

$$AP \text{ potatoes (mm)} = \frac{TA_{vt} \times LT_t + \sum (TA_{vs} \times LT_{70})}{10}$$

where

LT_{70} is thickness (cm) of each subsoil layer to 70 cm depth

$$MB \text{ (Wheat)} = AP \text{ (Wheat)} - MD \text{ (Wheat)}$$

$$MB \text{ (Potatoes)} = AP \text{ (Potatoes)} - MD \text{ (Potatoes)}$$

Where

MB is the Moisture Balance

AP is the Crop-adjusted available water capacity

MD is the moisture deficit, as determined by the agro-climatic assessment.

Table 8 Grade according to droughtiness

Grade/ Subgrade	Moisture Balance limits (mm)		
	<i>wheat</i>		<i>potatoes</i>
1	+30	and	+10
2	+5	and	-10
3a	-20	and	-30
3b	-50	and	-55
4	<-50	or	<-55

2.3.7 Agro-climatic data at Mantle's Farm is given in Table 3 and shows the site to have moderate rainfall, cool temperatures and moderate moisture deficits. The number of

¹³ From: MAFF, (1988), *Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land*.

field capacity days (FCD) is larger than the average for lowland England (150 days) and is relatively unfavourable for agricultural land works.

Table 3: Interpolated agro-climatic data

Agro-climatic parameter	Mantles Farm
Altitude (AOD)	160m
Average annual rainfall	787mm
Accumulated temperature above 0°C	1,324 day°C
Field capacity days	172 days
Average moisture deficit, wheat	91mm
Average moisture deficit, potatoes	79mm

- 2.3.8 The topsoils found during the survey correlate well with those described by the Soil Survey of England and Wales. Variation is seen in soil depth with profiles described in the published material extending to an average 90cm whilst the profiles found during the field survey were extremely shallow reaching an average of just 20cm before stones obstructed further investigation (Table 4).

Table 4: Soil profile descriptions from detailed soil surveys at Mantle's Farm

Mantle's Farm
0cm-20cm, dark brown (10YR3/3) silty clay loam; 25% soft chalk; variably calcareous; gentle to moderate slopes; shallow.

- 2.3.9 All profiles were consequently assessed as being of WCI and restricted to Grade 4 by a severe droughtiness limitation. Although no subsoils could be recorded this is not to say that they are absent and it is possible that soil impenetrable by auger could be reached by plant roots, however this cannot be assumed.
- 2.3.10 At Mantle's Farm some of the area was also restricted to no better than Subgrade 3b by gradients in excess of 8°.

Desktop assessment of Agricultural Land Classification

- 2.3.11 The Central Chilterns study area has also been subject to an intensive desk-based assessment of ALC which has relied on the interpretation of soil mapping, topography and agro-climatic data, and the interactions between each factor. This has enabled an assessment of likely soil textures, soil drainage status, landform, gradient, presence of or depth to poorly permeable soil layers and the extent to which crop growth may be limited by soil droughtiness.
- 2.3.12 A professional judgement was then made as to the predominant ALC grade which is likely for a soil with given characteristics in the climatic zone specific to CFA09. The judgement is influenced by the surveyor's experience of detailed surveys in the locality and on similar soil types. The resulting grade is that which is considered to be the most likely grade that would be found should a detailed site investigation be

conducted, although this does not mean in all cases that that grade will be found in practice.

2.3.13 Context land quality was ascertained using information derived from the provisional ALC maps of England and Wales produced by MAFF in the 1960s and 1970s. These maps show the section to be provisionally mapped as Grade 3 with some Grade 2 to the north. These maps were originally published at a scale of 1:63,360 and are available at a scale of 1:250,000 in paper and digital formats. These maps were published at strategic scales only and based on a methodology that has since been revised twice and they cannot be used definitively to classify individual sites and analysis of other information sources is necessary.

2.3.14 The principal physical factors influencing agricultural production and land quality are climate, site and soil, and the interactions between them.

Agro-climatic limitations

2.3.15 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km gridpoint data set for two representative locations within the study area and are out in Table 5. The data show the area to be generally cool and moist, with average rainfall of some 780mm per year. The average number of FCD is 170 which is greater than the average for lowland England (150 days) and is considered slightly unfavourable for providing opportunities for agricultural land working.

Table 5: Local agro-climatic conditions

Agro-climatic parameter	Little Missenden	South Heath
Altitude (AOD)	120m	190m
Average annual rainfall	756mm	806mm
Accumulated temperature above 0°C	1,370 day°C	1,290 day°C
Field capacity days	165 days	175 days
Average moisture deficit, wheat	98mm	87mm
Average moisture deficit, potatoes	87mm	75mm

Site limitations

2.3.16 The assessment of site factors is concerned primarily with the way in which topography influences the use of agricultural machinery and hence the cropping potential of land. At Mantles Farm gradient and microrelief with complex changes of slope angle or direction over short distances are considered likely to be a limiting factor to agricultural land quality, and similar localised limitations are likely across the rest of the study area.

2.3.17 Flooding is limited to the floodplains of the River Misbourne and does not affect any agricultural land within the construction boundary.

Soil limitations

- 2.3.18 There are three distinct soil types within the Central Chilterns study area which vary according to the geological units and deposits over which they developed. These are the loamy and clayey soils of the hilltops, the freely draining loamy soils of slopes, and the loamy and clayey soils of the floodplain. The main soil properties which affect the cropping potential and management requirements of land are texture, structure, depth, stoniness and chemical fertility. Together they influence the functions of soil and affect the water availability for crops, drainage, workability and trafficability.

Interactive limitations

- 2.3.19 The physical limitations which result from interactions between climate, site and soil are soil wetness, droughtiness and susceptibility to erosion. Each soil can be allocated a WC based on soil structure, evidence of waterlogging and the number of FCD. The topsoil texture then determines its ALC Grade according to Table 6 of the MAFF ALC guidelines, shown in Figure 3.

Figure 3: Agricultural Land Classification grade according to soil wetness¹⁴

Wetness Class	Texture ¹ of the top 25 cm	Field Capacity Days				
		<126	126-150	151-175	176-225	>225
I	S ² LS ³ SL SZL	1	1	1	1	2
	ZL MZCL MCL SCL	1	1	1	2	3a
	HZCL HCL	2	2	2	3a	3b
	SC ZC C	3a(2)	3a(2)	3a	3b	3b
II	S ² LS ³ SL SZL	1	1	1	2	3a
	ZL MZCL MCL SCL	2	2	2	3a	3b
	HZCL HCL	3a(2)	3a(2)	3a	3a	3b
	SC ZC C	3a(2)	3b(3a)	3b	3b	3b
III	S ² LS SL SZL	2	2	2	3a	3b
	ZL MZCL MCL SCL	3a(2)	3a(2)	3a	3a	3b
	HZCL HCL	3b(3a)	3b(3a)	3b	3b	4
	SC ZC C	3b(3a)	3b(3a)	3b	4	4
IV	S ² LS SL SZL	3a	3a	3a	3b	3b
	ZL MZCL MCL SCL	3b	3b	3b	3b	3b
	HZCL HCL	3b	3b	3b	4	4
	SC ZC C	3b	3b	3b	4	5
V	S LS SL SZL	4	4	4	4	4
	ZL MZCL MCL SCL	4	4	4	4	4
	HZCL HCL	4	4	4	4	4
	SC ZC C	4	4	4	5	5
Soils in Wetness Class VI - Grade 5						

¹For naturally calcareous soils with more than 1% CaCO₃ and between 18% and 50% clay in the top 25 cm, the grade, where different from that of other soils, is shown in brackets

² Sand is not eligible for Grades 1, 2 or 3a

³ Loamy sand is not eligible for Grade 1

Where: S = sand, Z = silt, C = clay, L = loamy and P = peat.

For sand the coarseness of the grain is sub-divided into coarse (c), medium (m) and fine (f). The subdivisions of clay loam and silty clay loam classes are indicated as medium (M) (less than 27% clay); heavy (H) (27-35% clay).

The average number of FCD in the Central Chilterns area is 170, and shown in the highlighted column.

¹⁴ From: MAFF, (1988), *Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land*.

- 2.3.20 Soils of the Frome association which are mapped alongside the River Misbourne have silty clay loam topsoils and are typically of WC IV due to waterlogging by high groundwater. Soils with these characteristics, in an area with an average of 170 FCD, are assessed as Subgrade 3b, moderate quality, according to Figure 3.
- 2.3.21 Coombe 1 and Charity 2 soils, typically of WC I and with silty clay loam topsoils, as described in Table 2, are most likely to be limited by droughtiness to Subgrade 3a, though the limitation may vary locally depending upon localised stone content, profile depth and site gradient.
- 2.3.22 The Batcombe association is predominant across the area, and becomes slowly permeable at 60cm which, under the local climatic conditions, results in the allocation of WC III. Soils of WC III with silt loam or silty clay loam topsoils are most likely to be assessed as Subgrade 3a, although may be of Subgrade 3b if the topsoil contains more than 27% clay.

3 Forestry

- 3.1.1 Data on the forestry resources in the study area has primarily been derived from the National Forest Inventory¹⁵. The area of land under forestry (i.e. trees and woodland) within 2km either side of the route centre line has been derived using a Geographic Information System (GIS), and is shown in Table 6.
- 3.1.2 The study area has a number of significant woodlands within the study area including ancient woodland at Mantles Wood, Farthings Wood and Sibley's Coppice which are all directly affected by the Proposed Scheme.

Table 6: Area of woodland within the study area and construction boundary

	Area of forestry land (ha)	Percentage of forestry land (%)
Forestry land in study area	410.9	17% (woodland land use within 4km-wide study area)
Total forestry land within construction boundary	13.8	6% of the land required for the construction of the Proposed Scheme is presently woodland

¹⁵ Forestry Commission, (2001), *National Forest Inventory Woodland and Ancient Woodland* (as updated).

4 Assessment of effects on holdings

- 4.1.1 The effects on holdings have been assessed through a series of interviews with farmers along the proposed route carried out between May 2012 and June 2013, as well as measurements of the applicable area of land required, according to the methodology set out in the Scope and Methodology Report (SMR) (Volume 5: Appendix CT-001-000/1) and the SMR Addendum (Volume 5, Appendix CT-001-000/2).
- 4.1.2 The nature of impacts considered comprises the temporary and permanent land required from the holding, the temporary and permanent severance of land, the permanent loss of key farm infrastructure and the imposition of disruptive effects (particularly noise and dust) on land uses and the holding's operations. These impacts occur primarily during the construction phase of the Proposed Scheme and are set out in Table 7.

Table 7: Summary of assessment of effect on holdings

Holding reference, name and description	Construction effects	Residual effects post restoration of land required temporarily
CFA09/1 Cokes Bottom Farm 97.1ha arable Medium sensitivity to change	Land required: 4.7ha (5%). Low impact Severance: none. Negligible impact Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft Code of Construction Practice ¹⁶ (CoCP). Negligible impact	Land required: 3.0ha (3%). Negligible impact Severance: none. Negligible impact Infrastructure: no demolition, and no other farm infrastructure affected. Negligible impact
	Overall temporary assessment: minor effect	Overall permanent assessment: negligible effect
CFA09/2 Mantle's Farm 114ha arable and woodland (arable land let) Medium sensitivity to change	Land loss: 43.6ha (38%). High impact Severance: access maintained to grain stores along public highway during construction. Medium impact Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP. Negligible impact	Land loss: 34.7ha (30%). High impact Severance: post construction access will be available over tunnel portal. Negligible impact Infrastructure: no demolition, and no other farm infrastructure affected. Negligible impact
	Overall temporary assessment: major/moderate effect due to the proportion of the holding required and severance	Overall permanent assessment: major/moderate effect due to the proportion of the holding required
CFA09/3* Hyde Farm 32ha grazing (most understood to be let)	Land loss: 13.3ha (42%). High impact Severance: access to the majority of the severed land will be maintained with the provision of an overbridge but there will be land to the north of the earthworks to which access will not be available. High	Land loss: 8.3ha (26%). High impact Severance: post construction access will be available over accommodation bridge. Low impact Infrastructure: no demolition, and no

¹⁶ Volume 5: Appendix CT-003-000

Holding reference, name and description	Construction effects	Residual effects post restoration of land required temporarily
Low sensitivity to change, understood to be formerly a specialist equestrian unit, but now majority of land holding rented to third party grazier	impact Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP. Negligible impact	other farm infrastructure affected. Negligible impact
	Overall temporary assessment: moderate effect due to the proportion of the holding required, severance and the low sensitivity of the holding	Overall permanent assessment: moderate effect due to the proportion of the holding required, severance and the low sensitivity of the holding
CFA09/4 Field Acres Farm 930.8ha arable Medium sensitivity to change	Land loss: 10.8ha (1%). Negligible impact	Land loss: 1.7ha (<1%). Negligible impact
	Severance: none. Negligible impact Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP. Negligible impact	Severance: none. Negligible impact Infrastructure: no demolition, and no other farm infrastructure affected. Negligible impact
	Overall temporary assessment: negligible effect	Overall permanent assessment: negligible effect
CFA09/5 Middle Grove Farm 183ha sheep, equestrian and other diversification activities Medium sensitivity to change	Land loss: 41ha (22%). High impact Severance: land severed by re-aligned Chesham Road. Medium impact Disruptive effects: dust is a potential problem with equestrian and diversified activities but controlled via the mitigation measures set out within the draft CoCP. Negligible impact	Land loss: 22.6ha (12%). Medium impact Severance: land severed by re-aligned Chesham Road. Medium impact Infrastructure: off-lying farm cottage (Meadowleigh) demolished. High Impact
	Overall temporary assessment: major/moderate effect due to the proportion of the holding required and severance	Overall permanent assessment: major/moderate effect due to the proportion of the holding required, severance and demolition
CFA09/6 * Bury Farm 35ha grazing (let) Low sensitivity to change	Land loss: 18.5ha (53%). High impact Severance: access lost during construction of green tunnel but access available via Frith Hill. Medium impact Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP. Negligible impact	Land loss: 12.1ha (35%). High impact Severance: none - access over green tunnel. Low impact Infrastructure: no demolition, and no other farm infrastructure affected. Negligible impact
	Overall temporary assessment: moderate effect due to the proportion of the holding required, severance and the low sensitivity of the holding	Overall permanent assessment: moderate effect due to the proportion of the holding required, severance and the low sensitivity of the holding

Holding reference, name and description	Construction effects	Residual effects post restoration of land required temporarily
CFA09/7 Mulberry Park Hill 11.1ha grazing (let) Low sensitivity to change	Land loss: 11.1ha (100%). High impact	Land loss: 10.2ha (92%). High impact
	Severance: none. Negligible impact	Severance: land inaccessible. High impact
	Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP. Negligible impact	Infrastructure: property demolition. High impact
	Overall temporary assessment: moderate effect due to the proportion of the holding required and low sensitivity	Overall permanent assessment: moderate effect due to the proportion of the holding required, severance, demolition and low sensitivity
CFA09/8 Springfield Farm 24ha grazing (let) Low sensitivity to change	Land loss: 5.9ha (25%). High impact	Land loss: 3.6ha (15%). Medium impact
	Severance: none. Negligible impact	Severance: none. Negligible impact
	Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP. Negligible impact	Infrastructure: no demolition, and no other farm infrastructure affected. Negligible impact
	Overall temporary assessment: moderate effect due to the proportion of the holding required and the low sensitivity of the holding	Overall permanent assessment: minor effect due to the proportion of the holding required and the low sensitivity of the holding
CFA09/9 Hammonds Hall Farm 4ha grazing (let) Low sensitivity to change	Land loss: 1.5ha (38%). High impact	Land loss: 0.3ha (8%). Low impact
	Severance: none. Negligible impact	Severance: none. Negligible impact
	Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP. Negligible impact	Infrastructure: no demolition, and no other farm infrastructure affected. Negligible impact
	Overall temporary assessment: moderate effect due to the proportion of the holding required and the low sensitivity of the holding	Overall permanent assessment: negligible effect
CFA09/10 Park Farm 27.8ha grazing Medium sensitivity to change	Land loss: 2.1ha (8%). Low impact	Land loss: 2.0ha (7%). Low impact
	Severance: none. Negligible impact	Severance: none. Negligible impact
	Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP. Negligible impact	Infrastructure: no demolition, and no other farm infrastructure affected. Negligible impact
	Overall temporary assessment: minor effect	Overall permanent assessment: minor effect
CFA09/12 * Elwis Field Farm	Land loss: 5.2ha (100%). High impact	Land loss: 2.2ha (42%). High impact
	Severance: none. Negligible impact	Severance: none. Negligible impact
	Disruptive effects: no impact on	Infrastructure: barn demolition. High

Holding reference, name and description	Construction effects	Residual effects post restoration of land required temporarily
5.2ha grazing Low sensitivity to change	agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP. Negligible impact	impact
	Overall temporary assessment: moderate effect due to the proportion of the holding required and the low sensitivity of the holding	Overall permanent assessment: moderate effect due to the proportion of the holding required, building demolition and low sensitivity
CFA09/13 *	Land loss: 2.4ha (61%). High impact	Land loss: 0ha (0%). Negligible impact
Un-named paddock	Severance: none. Negligible impact	Severance: none. Negligible impact
3.9ha grazing	Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP. Negligible impact	Infrastructure: no demolition, and no other farm infrastructure affected. Negligible impact
Low sensitivity to change	Overall temporary assessment: moderate effect due to the proportion of the holding required and the low sensitivity of the holding	Overall permanent assessment: negligible effect
CFA09/15 *	Land loss: 0.4ha (8%). Low impact	Land loss: 0.4ha (9%). Low impact
Farthings Wood	Severance: none. Negligible impact	Severance: none. Negligible impact
4.8ha woodland	Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP. Negligible impact	Infrastructure: no demolition, and no other farm infrastructure affected. Negligible impact
Low sensitivity to change	Overall temporary assessment: negligible effect	Overall permanent assessment: negligible effect
CFA09/16 *	Land loss: 1.3ha (95%). High impact	Land loss: 0.3ha (22%). High impact
94 Kings Lane	Severance: none. Negligible impact	Severance: none. Negligible impact
1.4ha residential with grazing	Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP. Negligible impact	Infrastructure: property demolition. High impact
Low sensitivity to change	Overall temporary assessment: moderate effect due to the proportion of the holding required and the low sensitivity of the holding	Overall permanent assessment: moderate effect due to the proportion of the holding required, property demolition and low sensitivity
CFA09/17 *	Land loss: 2.6ha (42%). High impact	Land loss: 0.1ha (2%). Negligible impact
Part of Sibley's Coppice	Severance: none. Negligible impact	Severance: none. Negligible impact
6.1ha woodland	Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP.	Infrastructure: no demolition, and no other farm infrastructure affected. Negligible impact
Low sensitivity to change		

Holding reference, name and description	Construction effects	Residual effects post restoration of land required temporarily
	Negligible impact	
	Overall temporary assessment: moderate effect due to the proportion of the holding required and the low sensitivity of the holding	Overall permanent assessment: negligible effect
CFA09/18 *	Land loss: < 0.1ha (2%). Negligible impact	Land loss: < 0.1ha (< 1%). Negligible impact
Part of Sibley's Coppice	Severance: none. Negligible impact	Severance: none. Negligible impact
1.5ha woodland	Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP. Negligible impact	Infrastructure: no demolition, and no other farm infrastructure affected. Negligible impact
Low sensitivity to change	Overall temporary assessment: negligible effect	Overall permanent assessment: negligible effect
CFA09/19 *	Land loss: 1.7ha (33%). High impact	Land loss: 0.0ha (0%). Negligible impact
Gates Farm	Severance: none. Negligible impact	Severance: none. Negligible impact
5.1ha grazing	Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP. Negligible impact	Infrastructure: no demolition, and no other farm infrastructure affected. Negligible impact
Medium sensitivity to change	Overall temporary assessment: major/moderate effect due to the proportion of the holding required and medium sensitivity	Overall permanent assessment: negligible
CFA09/20 *	Land loss: 2.3ha (89%). High impact	Land loss: 0.0ha (0%). Negligible impact
Un-named paddock	Severance: none. Negligible impact	Severance: none. Negligible impact
2.6ha residential with grazing	Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP. Negligible impact	Infrastructure: no demolition, and no other farm infrastructure affected. Negligible impact
Low sensitivity to change	Overall temporary assessment: moderate effect due to the proportion of the holding required and low sensitivity	Overall permanent assessment: negligible effect
CFA09/21 *	Land loss: 0.9ha (70%). High impact	Land loss: 0.0ha (0%). Negligible impact.
Orchard Cottage	Severance: none. Negligible impact	Severance: none. Negligible impact
1.3ha residential with grazing	Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP. Negligible impact	Infrastructure: no demolition, and no other farm infrastructure affected. Negligible impact
Low sensitivity to change	Overall temporary assessment: moderate effect due to the proportion of the holding required and low sensitivity.	Overall permanent assessment: negligible effect

Holding reference, name and description	Construction effects	Residual effects post restoration of land required temporarily
CFA09/22 * Frith Hill Farm 1.5ha residential with grazing Low sensitivity to change	Land loss: 0.7ha (47%). High impact	Land loss: 0.0ha (0%). Negligible impact
	Severance: none. Negligible impact Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP. Negligible impact	Severance: none. Negligible impact Infrastructure: no demolition, and no other farm infrastructure affected. Negligible impact
	Overall temporary assessment: moderate effect due to the proportion of the holding required and low sensitivity	Overall permanent assessment: negligible effect
CFA09/23 * Cottage Farm 16.9ha residential with grazing Medium sensitivity to change	Land loss: 0.1ha (< 1%). Negligible impact	Land loss: : < 0.1ha (1%). Negligible impact
	Severance: none. Negligible impact Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft CoCP. Negligible impact	Severance: none. Negligible impact Infrastructure: no demolition, and no other farm infrastructure affected. Negligible impact
	Overall temporary assessment: negligible effect	Overall permanent assessment: negligible effect

* No farm impact assessment interview conducted; data estimated.

5 References

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